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ABSTRACT

There is increasing debate over the unidimensionality of the construct "drive" in theories of behavior. The earliest drive theory postulated a simple entity which increased or decreased as a function of external or internal stimulation and affected behavior monotonically. Duffy and Malmo have recently hypothesized that the effects of drive are not monotonic, but curvilinear; high and low drive inhibit behavior, while moderate drive releases it. The present study examined the effects of different drive levels and sources on verbal productivity, disfluency, lexical redundancy ratios and distributions of lexical redundancy. The study examined the effects of perceived interviewer status, type of evaluation anticipated by interviewees (positive or negative) and specificity of interview question (high or low) on interviewees' verbal productivity and lexical redundancy. Subjects were undergraduates; interviewers were graduate and undergraduate students. Interviewer status and anticipated positive or negative evaluation were induced through visual and written cues. Disfluency results tend to support the Mahl-Osgood hypothesis; results for NSFR, mean and types support the Hull-Spence hypothesis; and results for verbal productivity, standard deviation, coefficient of variation, and variance fail to support either. (CHK)

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VERBAL BEHAVIOR AND DRIVE:
A THEORY IN CRISIS

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INTRODUCTION

Increasing debate over the unidimensionality of the construct "drive" may indicate a state of crisis existing in the community of scientists interested in cognitive processes and, more particularly, in drive theories of behavior. A philosopher-historian of science, T. S. Kuhn, argues that a scientific community experiences crisis when once universally accepted constructs, theories, or procedures are called into question.¹

One manifestation of crisis is the elaboration of an originally unitary construct. What had been simple is now complex. Ptolemy's cosmological paradigm, for example, possessed an elegant simplicity, and it initially accounted admirably for observations. However, as improvements in technology resulted in increased observational precision, increasingly unparsimonious principles had to be invoked to account for paradigmatically discrepant observations. The simple, elegant paradigm eventually became in the words of Copernicus "a monster."²

The earliest and most widely accepted drive theory postulated a simple, unidimensional, nonobservable entity--a quantity of energy--which would increase or decrease as a function of changes in external or internal stimulation.³ Such increases or decreases affected behavior monotonically. On the basis of recent research data, Duffy⁴ and Malmo⁵ have hypothesized that the effects of drive are not monotonic, but rather curvilinear: both high and low drive will inhibit behavior, whereas moderate drive will release it. In other words, moderate drive is maximally facilitative. Another, more fundamental complication has

been suggested. Lacey⁶ and Berkowitz,⁷ for example, have argued that there are qualitatively distinct types of drive, each producing distinct physical or behavioral manifestations, and that these types may interact in complex ways with particular types of external stimuli. Regarding the latter point, Singer and Schachter demonstrated that under conditions of chemically induced, high physiological arousal, persons reported feeling either "anxious" or "euphoric" depending upon whether they were exposed to unpleasant or pleasant external stimuli.⁸ In other words their subjective state was produced by the interaction between external cues and heightened drive, not by heightened drive alone.

The research which has begun to call into question the unidimensionality of drive has employed nonverbal measures almost exclusively. The results of those studies which have examined relationships between drive states and verbal behavior tend to support either Hull-Spence⁹ or Mahl-Osgood¹⁰ predictions, both of which postulate the unitary construct "drive" and both of which indicate monotonic effects. The predicted monotonic effects are in contradiction, however: the Hull-Spence theory predicts that verbal productivity and lexical diversity will increase as drive increases, whereas the Mahl-Osgood position suggests an opposite prediction. The fact that the results of drive and verbal behavior studies are often contradictory or inconsistent may suggest that the unitary, monotonic construct "drive" is inadequate for predictions regarding verbal as well as nonverbal behavior. Indeed, some research on verbal behavior

offers indirect support for the curvilinear hypothesis (the U hypothesis) of Duffy and Malmo.¹¹

The majority of drive and verbal behavior studies have been relatively simple, i.e., nonfactorial and univariate in nature. In a literal sense, they have not been designed to detect complex relationships. An important exception is a study by Pflager which compared the effects of internally and externally produced drive on several dimensions of verbal behavior.¹² Pflager's most interesting and pertinent result was this: ratio measures of lexical redundancy were sensitive to internally produced drive, whereas distributional measures of redundancy were sensitive to externally produced drive. Ratio measures reflect the relationship between the total number of words in a sample of speech and the total number of different words in that sample. Distributional measures are used to describe the frequency of occurrence of such relationships as they are distributed across a speech sample. Both types of measures have been employed as indicants of vocabulary redundancy. Pflager's finding, which has not been replicated, suggests that different drive sources may produce correspondingly different verbal manifestations.

We conducted a study designed to examine the effects of different drive levels and different drive sources on several verbal behavior variables: verbal productivity, disfluency, lexical redundancy ratios and distributions of lexical redundancy. We believed that a relatively complex study incorporating orthogonal manipulations of several situational variables and employing multiple measures would yield valuable insights into the possible

multidimensionality of drive as it relates to verbal behavior. Specifically, we examined the effects of perceived interviewer status (high vs. low), type of evaluation anticipated by interviewees (positive vs. negative), and specificity of interview question (high vs. low) on interviewees' verbal productivity and lexical redundancy. We thought that our status and anticipated evaluation inductions would produce four levels of drive.¹³ Also, each interview comprised four segments which allowed us to examine the verbal effects of fluctuations in drive level across time.

METHOD

Subjects

Ss were 64 undergraduate students at the University of Iowa who were randomly assigned to one of four conditions: High-Status Interviewer, Anticipated Positive Evaluation; High-Status Interviewer, Anticipated Negative Evaluation; Low-Status Interviewer, Anticipated Positive Evaluation; and Low-Status Interviewer, Anticipated Negative Evaluation.

Interviewers

Interviewers were graduate and undergraduate students at the University of Iowa. Each interviewer worked an equal number of times in each condition in order to prevent confounding idiosyncratic variables (response tendencies, appearance, etc.) with treatments.

Topics

On the basis of pilot study results, four interview topics were used: the value of grading, sexual behavior on campus,

the need for insurance, and problems of home ownership. Topic order was counter-balanced within conditions.

Status Induction

Cues associated with status differences were ascertained in a second pilot study. On the basis of pilot study results and previous research on status differences, three attributes were manipulated to produce perceptions of high or low interviewer status: position in the academic hierarchy (teacher vs. student), dress (suit and tie or dress, vs. casual wear), and seating position (interviewer behind desk vs. interviewer in front of desk). The interviewer's academic position was established orally prior to the interview.

Anticipated Evaluation Induction

Anticipated positive or negative evaluation was induced by a written statement presented to Ss after the oral status induction. This statement ostensibly contained information about the purpose of the study. In the negative condition, Ss were told that they were participating in the first phase of an experiment which would be completed the following semester; that the second phase would require highly critical, intelligent, and demanding interviewers; and that the researchers were interested in retaining those interviewers whom Ss perceived to be extremely critical. Ss were then informed that the person who would soon interview them had attained a very high score on an I.Q. test and had demonstrated a clearly critical nature on Johnson's Test of Personal Tendencies, a bogus instrument. After reading the induction, Ss responded to two questions designed to strengthen

the negative response set, an example being: "How do you feel about a person whom you perceive to be cold?--tense, noncommunicative, worried, or hostile." In the positive condition, the induction was the same except the interviewer was described as a tolerant, flexible person of moderate intelligence, and Ss responded to two "positive" questions.

Question Specificity

Four types of questions were asked about each of the four topics. The first type we called "yes-no" (Are you aware of the sexual revolution?), the second "labeling" (What percentage of college students engage in premarital sex in your opinion?), the third "explanatory" (Assuming that sexual practices and attitudes are more open now, why do you think this is so?), and the fourth "open-ended" (What are your feelings about premarital sex?). The first two question types are relatively focused, the second two relatively unfocused. In all cases questions were presented in the order indicated above.

Measures

All interviews were audiotaped. Transcripts were obtained from the tapes and these were subsequently entered, word for word, into the computer. FREQDIC, a lexical statistics program, was used to obtain raw scores for lexical redundancy.¹⁴ This program yields five ratio scores per subject response (e.g., type-token ratio, mean segmental TTR, and log TTR) and nine distributional scores (e.g., Yule's Q , Herdan's v_m , skewness, and kurtosis). Verbal productivity was another measure.

This is simply the total number of words spoken by a subject in response to each interview question. A final measure was a disfluency ratio. "Non-ah" nonfluencies were scored according to Mahl's system. A ratio of number of disfluencies to number of words was obtained for each response.

Procedure

Ss reported to a central waiting room and were taken to the interview room by a confederate. The confederate asked five standardized questions of the subject, one of each of the first three types and two of the fourth type. (What is your major? Why did you come to The University of Iowa? etc.). These questions established a baseline of verbalization for each subject before administration of the inductions. After Ss responded to the introductory questions, the status and anticipated evaluation variables were induced. Interviewers were then introduced and they proceeded to ask their questions. Interviewers were instructed to use head nodding, "um hum," and other responses which were neither overtly positive nor negative. They were also instructed to ask only the questions provided them and not to probe for information or comment upon responses.

Data Analysis

Raw scores yielded by the FREQDIC program were subjected to 20 separate factorial analyses of variance: status x anticipated evaluation x interview segment x question specificity. We used the BMDP2V "Repeated Measures Analysis of Variance with Covariates" program to analyze the data.⁵ The .05 level of

significance was set for all comparisons.

Results

Disfluency

1. A main effect was found for status ($F=2.92$, df 1, 59; $p > .05 < .08$). High-status interviewers produced more disfluency than did low-status interviewers ($\bar{X}$'s = .045 and .029, respectively).

2. A main effect was obtained for question specificity ($F=21.01$; df 3, 180). Duncan's Test showed that the explanatory questions produced more disfluency ($\bar{X}=.048$) than did the yes-no (.016), labeling (.030) or open-ended questions (.037). Open-ended questions produced more disfluency than did yes-no questions, as did labeling questions.

Verbal Productivity

1. A four-factor interaction was obtained for the interview segment analysis: segment $\times$ status $\times$ anticipated evaluation $\times$ question specificity ($F=2.14$; df 9, 540). This complex interaction can be interpreted most usefully in the context of a significant three-factor interaction described next.

2. A segment $\times$ status $\times$ anticipated evaluation interaction was obtained ($F=3.17$; df 3, 180). A test for simple effects showed that HS+E Ss were more productive ($\bar{X}=35.75$) than were LS-E Ss (25.84) during the first interview segment. During the second segment, HS+E Ss were more productive (43.00) than were HS-E Ss (28.94), LS+E Ss (24.30), and LS-E Ss (31.06). During the third segment, HS+E Ss were more productive (40.48) than were LS+E Ss (26.97). During the fourth segment, HS-E Ss were more productive (45.80) than were LS+E Ss (30.60) and LS-E Ss

(23.41); HS+E Ss (39.26) were more productive than were LS-E Ss. (See Figure 1.) Graphing of the means and simple effects

INSERT FIGURE 1 HERE

analyses suggested that these three-factor interactive effects are bound to the third and fourth question types primarily; the yes-no and labeling questions produced relatively little between groups variability. So during the first, second, and third interview segments, HS+E Ss produced the most verbal output. During the fourth segment HS Ss in both anticipated evaluation conditions were more productive than were LS Ss.

3. Status interacted with question specificity ($F=3.21$; df 3, 180). Simple effects tests indicated that the explanatory and open-ended questions were implicated primarily. For these question types HS Ss produced more verbal output ($\bar{X}$'s=55.55 and 50.52, respectively) than did LS Ss (37.58 and 38.82). HS Ss and LS Ss did not differ in their responses to the yes-no and labeling questions.

4. A significant main effect was obtained for status ($F=6.28$; df 1, 59), though this effect is qualified strongly by the interactions described above. HS Ss were more productive than were LS Ss ($\bar{X}$'s=37.08 and 27.97, respectively).

5. Question specificity produced a significant main effect ($F=78.04$; df 3, 180) Duncan's Test showed that yes-no questions produced less verbal output ($\bar{X}=8.52$) than did labeling questions (30.37), explanatory questions (46.57) and open-ended questions

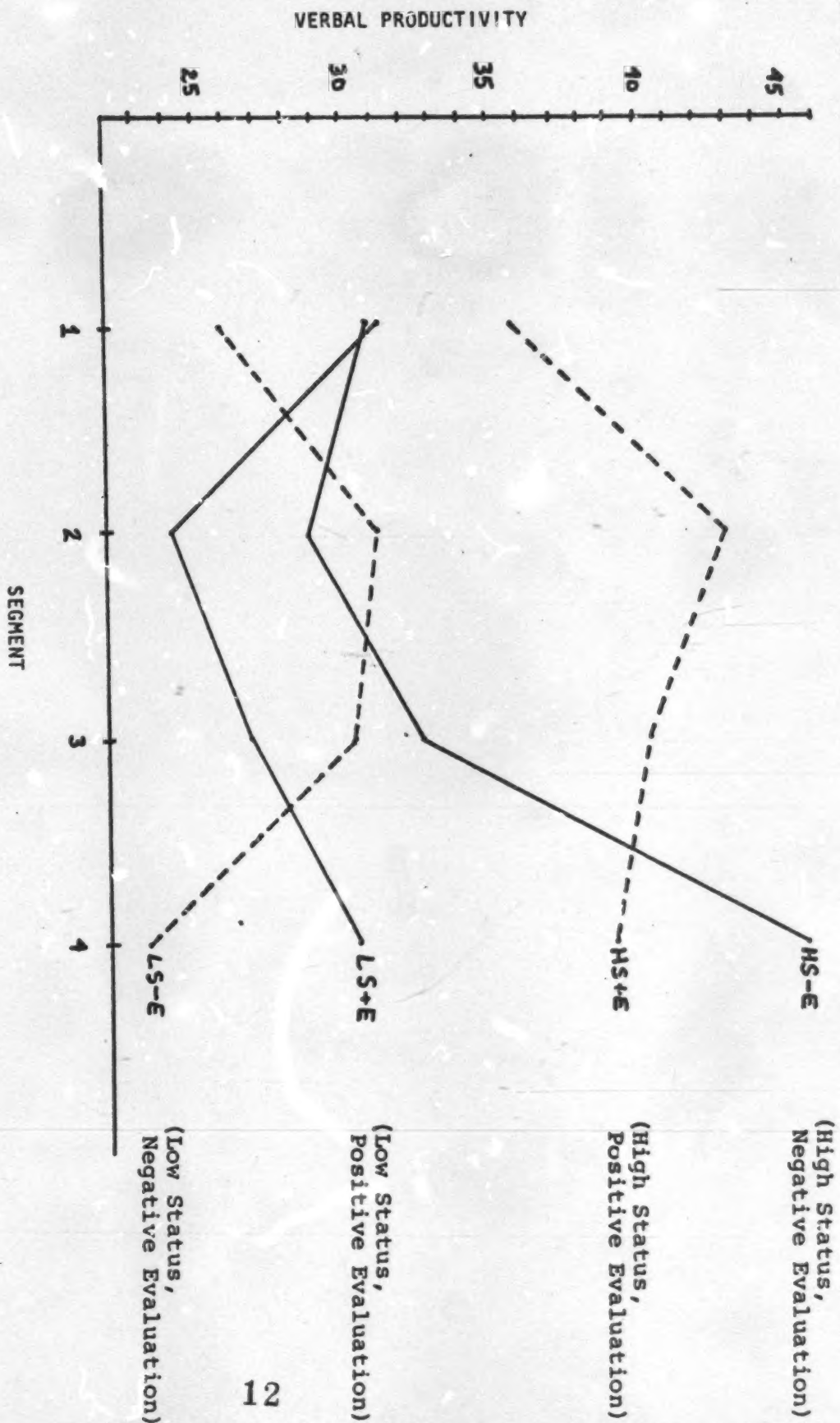


FIGURE 1. Interaction of Interviewer Status, Anticipated Evaluation, and Interview Segment for Verbal Productivity

(44.67). Types three and four did not differ from each other; both differed from one and two.

Ratio Measures

1. Analysis of the MSTTR scores yielded a main effect for anticipated evaluation ($F=4.26$; df 1, 43).¹⁶ Ss in the anticipated negative evaluation condition had a higher mean MSTTR (25) than did Ss in the anticipated positive evaluation condition ($\bar{X}$'s=.851 and .830, respectively).

2. A status x anticipated evaluation interaction occurred for the log TTR measure ($F=4.05$; df 1, 60). Ss in the high status-anticipated positive evaluation condition and in the low status-anticipated negative evaluation condition had the highest mean log TTR (.81). Ss in the low status-anticipated positive evaluation condition had the lowest mean log TTR (.76). The mean log TTR of Ss in the high status-anticipated negative evaluation condition fell between these extremes (.78).

Distributional Measures

1. An anticipated evaluation x interview segment interaction occurred for the standard deviation, variance, and coefficient of variation measures (F 's=3.81, 4.58, 2.70, respectively; df 3, 180). The form of this two-factor interaction resembles that of the three-factor interaction obtained for verbal productivity, though in this case the status variable is not implicated. Generally, in the anticipated positive evaluation conditions scores for the three measures increase from the first to the second segments and then decrease across

the third and fourth segments. On the other hand, in the anticipated negative evaluation conditions scores decrease from the first to the second segments and then increase across the third and fourth segments. The one exception to this pattern occurs for variance. In this case Ss mean scores in the anticipated positive evaluation conditions decrease from segment one to segment two, increase in the third segment, and again decrease in the fourth segment. (See Table 1).

INSERT TABLE 1 HERE

2. Status produced a main effect for the variance measure ($F=4.25$; df 1, 60). Ss in the high-status condition had higher mean variance scores than did Ss in the low-status condition (.388 and .560, respectively).

Ancillary Results

1. Two measures, which were neither of the ratio nor the distributional type, were sensitive to the status induction. Specifically, Ss in the high-status condition produced more types ($\bar{X}=24.43$) and had a higher mean (1.28) than did Ss in the low-status condition (20.45 and 1.22, respectively; F 's=3.51 and 4.57, respectively; df 1, 60).

2. Question specificity affected all of the measures. Simple effects tests suggested that the first question type (yes-no) differed from the other three types; in a few cases, the second question type (labeling) differed from the third and fourth types. In light of the results for verbal productivity,

INTERVIEW SEGMENT	POSITIVE EVALUATION (+E)					NEGATIVE EVALUATION (-E)				
	Verbal Prod.	Stan. Dev.	Coef. of Var.	Var.		Verbal Prod.	Stan. Dev.	Coef. of Var.	Var.	
1	31.13	.472	32.62	.458		30.62	.475	33.81	.408	
2	37.30	.580	38.14	.351		26.34	.406	28.81	.360	
3	35.71	.520	34.86	.516		29.52	.444	30.87	.392	
4	31.61	.477	34.61	.399		37.92	.541	35.89	.632	

TABLE 1. Cell Means Illustrating Interaction Between Anticipated Evaluation and Interview Segment for Four Measures

this indicates that large differences in the size of speech samples will affect the values yielded by both ratio measures and distributional measures. Some distributional measures, e.g., coefficient of variation and Yule's K, are widely held to be relatively insensitive to differences in speech sample sizes.

Discussion

Our disfluency results offer some support for the Mahl-Osgood hypothesis which claims that anxiety is cognitively disruptive: high-status interviewers and decreased question specificity produced relatively high levels of interviewer disfluency. Results of the MSTTR analysis lend some support, albeit weak, to the Hull-Spence hypothesis which claims that increased anxiety facilitates well-learned responses monotonically. If one assumes that in formal contexts speakers have learned that precise speech is demanded, then one would expect that in such contexts anxious speakers would exhibit higher MSTTR's. Interviewees in our anticipated negative evaluation condition did exhibit relatively high MSTTR's. Ss in the high-status condition also produced more types, higher variance scores, and higher mean scores.

High-status interviewers elicited more speech from interviewees than did low-status interviewers, a result which is consistent with that obtained by Pope and Siegman.¹⁷ These researchers explained this result in terms of the Hull-Spence hypothesis. However, our interactive effects indicate that the verbally facilitating effects of high status are bound to low-specificity questions and to particular combinations of

anticipated evaluation and interview segment. These interactive effects suggest that increases in drive do not affect verbal productivity monotonically. During the first, second, and third interview segments, the verbal productivity of HS-E Ss was highest; the output of Ss in the other conditions was rather uniformly depressed. During the fourth segment, a dramatic increase in output occurred in the HS-E condition. This result seems anomalous from the standpoints of both the Hull-Spence and Mahl-Osgood hypotheses. If in fact the HS-E condition produced the highest level of arousal, why were Ss in this condition not maximally or minimally productive throughout? Or, more particularly, assuming that drive decreased across interview segments,¹⁸ why was not the relationship among HS-E and the other conditions at least a stable function of that decrease?

The Duffy-Malmo inverted U hypothesis may provide an answer. As suggested earlier this hypothesis indicates that both high and low arousal are inhibiting, whereas moderate arousal is releasing. This would seem to square with the results for the first three segments, if we assume that low-status interviewers produced low arousal regardless of the type of evaluation which interviewees anticipated from them; i.e., anticipated evaluation became salient only when the interviewer possessed high evaluation potential. It is likely that the high arousal of Ss in the HS-E condition decreased to a more moderate level by the fourth segment, for no actual negative evaluation was offered by interviewers. Possibly the inter-

viewers' neutral responses came to seem positive when contrasted with interviewees' negative expectations. So perhaps the decreased arousal of HS-E Ss resulted in increased verbal output. Thus, the change in HS-E Ss behavior may support the Duffy-Malmo hypothesis also. Similarly, the results for standard deviation, coefficient of variation, and variance seem consistent with the U hypothesis. This interpretation is, of course, speculative. A more direct test of the U hypothesis can be made by systematically increasing drive in one group of interviewees (low to moderate to high) and decreasing it in a second group, as opposed to allowing drive to fluctuate uncontrolled across interview segments.

To summarize, the disfluency results tend to support the Mahl-Osgood hypothesis; the results for MSTTR, mean, and types offer support for the Hull-Spence hypothesis, and the results for verbal productivity, standard deviation, coefficient of variation, and variance fail to support either of the hypotheses. Taken together, the results suggest that increased drive serves to improve or to deteriorate verbal performance, depending on which aspect of performance is being scrutinized.

Our results differ in several respects from those obtained by Pflager in the study we mentioned earlier:

1. Regarding verbal productivity, Pflager found no significant differences between persons with high or low trait anxiety, nor did she find differences between speakers in situations designed to produce high or low state anxiety. In our study productivity

was strongly affected by differences in drive-related situational variables.

2. Pflager's situational manipulation did not produce significant differences for the MSTTR measure. This measure was, however, sensitive to our manipulation of the type of evaluation anticipated by interviewees.

3. The distributional measures which were sensitive to Pflager's situational manipulation, namely, skewness, kurtosis, Herdan's v_m , and Yule's K, were apparently unaffected by our situational manipulations with the exception of question specificity, which, as we suggested earlier, appears to have produced artifactual results as a function of wide differences in speech sample sizes.

4. Three distributional measures which were not used by Pflager, namely, standard deviation, variance, and coefficient of variation, were affected by one or more of our situational manipulations.

5. While employing a more complex design than many of the previous studies, Pflager was limited to inferences regarding one situational source of drive (personal vs. impersonal interview). Our design manipulated orthogonally four sources of situational drive and hence allowed us to make

more complex inferences regarding the relative effects of specific situational differences. It is worth noting that verbal productivity, when covariance adjusted for differences in individual response tendencies, was sensitive to all of the situational manipulations at some level of analysis. On the other hand, when considered individually, disfluency ratios, lexical redundancy ratios, and lexical distribution scores were apparently insensitive to one or more of the manipulations.

It seems to us that at the level of general implications the results of our study and those of Pflager's are not incompatible, however. In both studies inferred differences in drive states resulted in a lack of empirical correspondance among types of verbal behavior: one manipulation affected this sort of behavior, another that. Further, this lack of correspondance was shown to have theoretical consequences: one result supported this hypothesis, another that. On the basis of our findings and those of Pflager, it seems reasonable to suggest that verbal productivity, disfluency, lexical redundancy ratios, and lexical redundancy distributions are not equivalent empirical indicants of a unitary drive state. Rather, these several types of measures appear to be relatively independent indices of different drive states and different drive sources.

Well, what then should be used as an indicant of drive? This question now strikes us as exceedingly problematic and probably ill formulated. As mentioned earlier there is evidence

which indicates that subjective and physiological measures of drive fail to correspond neatly. Moreover, it has been suggested that behavioral measures are independent also.¹⁹ Further, as we have shown, even specific behavioral measures, e.g., disfluency and coefficient of variation, fail to correspond. Still further, findings regarding single, ostensibly drive-related measures, e.g., MSTTR, have failed to correspond across numerous studies to a remarkable extent. Perhaps a better question is: What should be used as indicants of drives? In short, we may have to talk of type-one drive, type-two drive, etc. This terminological proliferation may be a symptom of a "scientific crisis," to use Kuhn's term. Kuhn's analysis of the resolution of scientific crises suggests a few possible outcomes. First, future improvements in measurement technology may indicate that the apparent independence of types of drive was an artifact of measurement error. Second, we may have to live for some time with an increasingly cumbersome set of constructs, the interconnections among which are increasingly fuzzy. Third, and finally, a totally new, simpler construct or set of constructs may be shown to account for apparent discrepancies. If this happens, drive and its progeny - drive type one, drive type two - may be driven out of the community, never to return. Kuhn argues strongly, and we agree, that the expulsion of a construct or theory is a last resort, never to be undertaken prematurely. We should continue to wrestle with drives or drive until something clearly better comes along.

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